



AVIAN INFLUENZA AND THE PANDEMIC THREAT PREPAREDNESS AND RESPONSE

You have undoubtedly heard or read about the avian influenza (“Bird Flu”) as well as “Pandemic Flu.” The purpose of this communication is to provide you with useful information about avian influenza, the potential threat of a “pandemic” and what efforts are being made NASA-wide to deal with this threat. Although press reports about avian flu and the pandemic threat have generally been accurate, many people have been confused by multiple terms that have been used interchangeably to describe different but related phenomenon.

What is a Pandemic and “Pandemic Flu”?

The word "pandemic" comes from the Greek words "*pan*" meaning ‘all’ and "*demos*" which means ‘people or population.’ A pandemic is an outbreak of disease occurring over a very wide area, crossing international boundaries, that affects a large number of people all over the world. Like earthquakes, tidal waves, hurricanes and droughts, pandemics are part of the natural order of things even though they are unpredictable. There have been at least 10 pandemics over the past 300 years. Some have been severe (Spanish flu of 1918) and some have been mild (Hong Kong flu of 1968-69). “Pandemic Flu” is flu that causes a global outbreak of serious illness that is highly contagious.

What are differences between human influenza and avian influenza and how are they related to each other?

Human influenza is the standard seasonal “flu” that occurs on an annual basis usually in the winter time. Every year, a different strain of human flu virus makes its way through the population. Months before ‘flu’ season begins scientists make an educated guess as to which strain will be responsible for the upcoming flu season. A vaccine designed to induce an immune response to the specific flu virus is manufactured and administered to the population (“flu shot”) to protect as many people as possible from getting infected. Seasonal flu can make even healthy people pretty sick. However, the very young, elderly, pregnant women and those with chronic medical conditions are at increased risk for serious complications. Each year, 14,000 to 40,000 Americans die of seasonal flu. Getting a flu shot every year prevents illness, minimizes lost work time and reduces spread of flu throughout the community. It is your best protection against getting the flu.

Avian influenza is a flu virus that infects wild bird populations. It generally does not cause widespread sickness and death in these species. However, because the virus is

present in the secretions and droppings of wild birds, bird flu can spread to domestic bird populations such as chickens, ducks, and turkeys. When that happens, the disease can spread explosively through closely contained flocks and is frequently lethal. In large dense populations, the virus can mutate and evolve the ability to ‘jump species’ and infect other animals such as pigs and other mammals including humans.

The H5N1 strain of bird flu virus was first identified in South African wild terns in 1961. Throughout the next 40 years it spread naturally throughout global bird populations before it exploded in domestic bird populations in Asia in 2003. The first human case of bird flu was in Hong Kong in 1997. Since then human cases have emerged in Vietnam, Thailand, Cambodia, and Indonesia. As of June 2005, over a hundred cases of bird flu in humans had been documented. The mortality rate in these cases exceeded 50%. Most cases resulted from direct contact with infected poultry.

Why worry about a pandemic if only 100 human cases of avian influenza have been reported world-wide?

One hundred cases do not make a pandemic. There are four ingredients in the recipe for a pandemic. The first is an animal reservoir (pigs, chickens, bats, rats, wild birds, etc.). The second is an interspecies jump from animals to humans. The third is a highly virulent organism capable of causing severe disease in humans who have no immunity to it. The fourth is *sustained* human-to-human transmission of the disease without the requirement for exposure to birds. Avian influenza has fully demonstrated three out of four. Human-to-human spread has been reported in two cases but *sustained* human-to-human transmission has fortunately not been observed yet.

Is the pandemic risk real?

Yes. An overwhelming majority of national and international experts agree another “global pandemic” is inevitable. It is not a question of “if” but rather “when” and “how bad.” The Hong Kong flu of 1968-69 was a pandemic but it was rather mild because the virulence (the ability to cause disease) of that virus was low. On the other hand, the virus that caused the Pandemic of 1918 was very virulent. It killed 675,000 Americans (out of a population of just over 100 million people) and 50-100 million people world-wide. Researchers recently confirmed the 1918 virus started out as an avian influenza.

Unfortunately, the *risk* of such an event cannot be adequately quantified because pandemics are, by their very nature, *unpredictable*. However, the ongoing attributes of avian influenza (bird flu) are the right *constellation of events* that increase the probability of a pandemic.

What changes are needed for the H5N1 virus to become a pandemic virus?

The H5N1 virus can evolve its ability to sustain person-to-person transmission via two principal mechanisms. The first is a “reassortment” event. Viruses in human (or other)

hosts exchange genetic material with other viruses. Avian flu and standard human influenza viruses can inhabit the same person at the same time. The worst case scenario would be a reassortment event resulting in a virus with the mortality of avian influenza *and* the contagiousness (infectivity) of human 'flu.' This scenario would manifest in a sudden surge of cases with explosive spread.

The second, most likely mechanism is a more gradual process of adaptive mutation (i.e. evolution) whereby the capability of the virus to bind to human cells steadily increases during subsequent infections of humans. This mechanism would express itself initially as small clusters of human cases with increasing evidence of sustained person-to-person transmission. The slower 'ramp up' would probably give the world some time to take defensive action.

Is there a vaccine for avian influenza?

Yes, a vaccine exists, but it is not ready for commercial production. Medical scientists have developed a promising H5N1 vaccine that appears to initiate an immune response (the goal of all vaccines) in healthy adults. Testing of the vaccine is now underway.

What about medications for influenza?

Two drugs appear to reduce the severity and duration of illness caused by seasonal influenza if given within 48 hours of the onset of symptoms. Classified as neuraminidase inhibitors, the drugs are Tamiflu® (oseltamivir) and Relenza® (zanamivir). Tamiflu® is given orally and Relenza® is administered by nasal mist (intranasally). Side effects of the two drugs are primarily gastrointestinal.

For cases of human infection with H5N1 avian influenza, the drugs may improve prospects of survival, if administered early, but clinical data are limited. The main drawback for these drugs, especially Tamiflu®, is limited world-wide production capacity. Tamiflu® is manufactured only in one facility in Switzerland.

The older, M2 Ion Channel inhibitor class of antiviral drugs, Symmetrel® (amantadine) and Flumadine® (rimantadine), does not appear to be useful against avian flu. However, they may be useful for reducing the seriousness of cases of seasonal influenza if given within 48 hours of onset of symptoms.

Can a pandemic be prevented?

The best way to prevent a pandemic would be to eliminate the virus from birds, but this appears increasingly unlikely within the foreseeable future.

Recent studies, based on mathematical modeling, suggest antiviral medications could be used as a protective measure near the start of a pandemic to *reduce the risk* of a fully transmissible virus or at least to delay its international spread, thus gaining time to augment vaccine supplies.

What is NASA doing to prepare for this threat?

Since the most important NASA asset is its people, the Office of the Chief Health and Medical Officer has established a Pandemic Contingency Planning Working Group. This group is developing a model that identifies vital and vulnerable employee populations, telecommuting strategies, human resource issues and site security planning with the overall goals of protecting NASA assets on the ground and in space and maintaining essential business continuity. As this plan continues to develop, we will engage our partners and share the results with the entire NASA family.

In addition to the Working Group, OCHMO continuously monitors news and guidance on this topic from the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), the Department of Health and Human Services (DHHS) and the State Department. This includes medical surveillance, tracking of the disease, efforts on the development of a vaccine, development and production of anti-viral medications and pandemic preparedness plans. The WHO issued its Global Influenza Preparedness Plan earlier this year and the DHHS has issued a draft plan.

NASA sites are encouraged to keep up to date on state and local plans in their communities since many governments either have issued draft plans or have approved plans in place. In addition, Center Occupational Health Offices are being directed to conduct awareness campaigns on universal hygiene behaviors especially hand washing, voluntary home confinement of symptomatic persons and “cover the cough” campaigns utilizing CDC guidance.

What can I do to protect myself and my family?

- **Be Prepared**

The initial effects of a verified pandemic outbreak in the United States will most likely be economic rather than medical. Borders may close, even if only temporarily. Transportation, especially international travel, may be curtailed. Activities involving close human contact (education, theaters, movies, restaurants, etc.) may be discouraged. Schools will be closed. Areas involved in outbreaks will be quarantined. Local inventories requiring frequent re-supply (such as groceries) may decrease significantly, especially during the early phases of the pandemic.

Due to expected disruptions in transportation, you should have enough food on hand to last a couple of weeks. A general review of your family’s consumption pattern may reveal the need to stock up on certain items that may quickly be in short supply. Essential infrastructure such as power and water are far less likely to be a problem.

- **Get Flu Shots**

Although the standard “flu shot” does not protect you from Avian flu, getting immunized will protect you and your family from seasonal influenza. The more people who are

immunized, the better your community is protected from seasonal influenza and complications resulting from flu infection

- **Practice excellent hygiene**

Wash your hands frequently with soap and water. Encourage all family members to do the same. In order to clean your hands effectively, you should continue to lather up for 15 seconds or as long as it takes to sing “Happy Birthday” to yourself at least twice.

Periodically clean common use items that may have come into contact with dirty hands or secretions (telephones, door handles, etc.). Covering the nose and mouth during coughing and sneezing, and then properly disposing of soiled tissues also reduce spread of disease. Avoid rubbing your eyes, especially after contacting potentially contaminated surfaces. Avoid shaking hands with obviously ill individuals, or wash your hands immediately afterwards. Do not share eating utensils with individuals who are ill.

Healthy behaviors keep your immune system at its peak. Get adequate rest, eat a nutritious and balanced diet, exercise regularly, and wear clothing appropriate for the climate.

Stay home from work or social events if you develop flu symptoms.

- **Stay vigilant and focused**

If an outbreak does occur, do not panic. Monitor the news.

Your best defense is to minimize contacts between your family and the outside world as much as possible. Remember, flu is transmitted through direct or indirect contact from human to human by exposure to viruses in the air (cough) or on a surface (left by an infected individual and inadvertently transferred to your own mucous membranes by your *own* hand).

For additional information, go to http://www.ohp.nasa.gov/alerts/avian_flu.html